Executive Summary: Overwater Structures: Freshwater Issues

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As part of the process outlined in Washington's *Statewide Strategy to Recover Salmon: Extinction is Not an Option* the Washington Departments of Fish and Wildlife, Ecology, and Transportation were charged to develop Aquatic Habitat Guidelines employing an integrated approach to marine, freshwater, and riparian habitat protection and restoration. Guidelines will be issued, as funding allows, in a series of manuals addressing many aspects of aquatic and riparian habitat protection and restoration.

This document is one of a series of white papers developed to provide a scientific and technical basis for developing Aquatic Habitat Guidelines. The white papers address the current understanding of impacts of development and land management activities on aquatic habitat, and potential mitigation for these impacts.

The scope of work for each white paper requested a "comprehensive but not exhaustive" review of the peer-reviewed scientific literature, symposia literature, and technical (gray) literature, with an emphasis on the peer-reviewed literature. The reader of this report can therefore expect a broad review of the literature, which is current through late 2000. Several of the white papers also contain similar elements including the following sections: overview of the guidelines project, overview of the subject white paper, assessment of the state of knowledge, summary of existing guidance, recommendations for future guidance documents, glossary of technical terms, and bibliography.

This white paper evaluates the state of knowledge of the effects of on-, in-, and over-water structures on the functioning of freshwater ecosystems and their relation to salmonids. Scientific and technical literature on the subject was compiled and examined, and input from experts on freshwater habitats and organism life histories was solicited and evaluated. Effects on an array of organisms and communities were considered.

In order to analyze and present the available data in a logical and easily referenced format, the information sources are divided into either direct or indirect mechanisms of impact, then categorized by the type of response observed.

Three direct mechanisms of impact associated with over-water structures were identified: shore-zone habitat structure changes, shading and ambient light changes, and disruption of water flow pattern and energy. One indirect mechanism of impact associated with construction activities and ongoing operation of over-water structures was identified: physical/chemical environmental disruption (e.g., water quality degradation and noise). Interrelated effects of over-water structure use and operation (i.e., boating activities) are also included under the discussion of this indirect mechanism of impact.

Over-water structures often induce simultaneous responses on predation, behavior, and habitat function, potentially confounding the assessment of any individual response. However, such structures may induce a response in an organism without eliciting a response from its habitat and without promoting a response to its predator-prey system. For this reason and in the interest of clarity, a simple three-part categorization is used here for the range of responses. Under each of the direct mechanisms of impact, available research is grouped into the following categories of response: predation, behavior, and habitat function.

A summary of findings of impacts resulting from changes induced by on-, in-, and over-water structures and associated construction and operation activities is presented under each mechanism of impacts and depicted in flow diagrams. In addition, information gaps are identified and summarized.

Habitat protection, restoration, and mitigation techniques pertaining to the over-water structures and associated activities are analyzed and presented. Also, a summary of the regulatory framework governing over-water structures is included.

Finally, this white paper presents recommendations intended for the development of future policy and guidance documents that address the environmental impacts of over-water structures and associated construction and operation activities.